UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,197	01/14/2004	Jimmie Earl DeWitt JR.	AUS920030556US1	3551

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IBM CORP (YA)
C/O YEE & ASSOCIATES PC
P.O. BOX 802333
DALLAS, TX 75380

EXAMINER
DAO, THUY CHAN

ART UNIT	PAPER NUMBER
2192	

NOTIFICATION DATE	DELIVERY MODE
01/30/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ptonotifs@yeeiplaw.com

	Application No.	Applicant(s)
Office Action Summary	10/757,197	DEWITT ET AL.
	Examiner	Art Unit	
	Thuy Dao	2192	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE __03__ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *16 November 2007*.

2a) ☒ This action is **FINAL**.   2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1,11 and 20* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1,11 and 20* is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *14 January 2004* is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a) ☐ All   b) ☐ Some *   c) ☐ None of:

      1. ☐ Certified copies of the priority documents have been received.

      2. ☐ Certified copies of the priority documents have been received in Application No. _____.

      3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. This action is responsive to the amendment filed on November 16, 2007.

2. Claims 1, 11, and 20 have been examined.

Response to Amendments

3. Per Applicants' request, claims 1, 11, and 20 have been amended.

Response to Arguments

4. Applicants' arguments have been considered. However they are not persuasive.

a) Remarks, page 7, last two paragraphs:

The examiner respectfully disagrees with Applicants' assertions. IBM-HPM explicitly teaches *obtaining performance profile data accumulated during a trace of a computer program execution* (e.g., page 3, obtaining/providing detailed processor/system data; page 6, collecting/obtaining necessary events/counts such as L1/L2 misses, branches, branch misses, cache misses; and page 27, obtaining and saving performance profile data accumulated in performance files).

b) Remarks, page 8, first paragraph:

The examiner respectfully disagrees with Applicants' assertions. IBM-HPM explicitly teaches *modifying performance profile data accumulated during a trace of a computer program execution to form annotated performance profile data* (e.g., page 27, taking as input said performance files, modifying/annotating said performance profile data, and displaying said annotated performance profile data in HPMVIZ windows as in page 28).

c) Remarks, page 8, second paragraph:

The examiner respectfully disagrees with Applicants' assertions. IBM-HPM explicitly teaches *wherein the one or more events occur based on hardware counter values and performance indicators associated with one or more portions of the computer program* (e.g., page 4, motivations to use hardware counters in IBM-HPM;

pages 5 and 8, using hardware counter/HPM Toolkit to profile events associated with program executed on IBM SPs and Power systems; and furthermore in page 9-12, HPM Count, Hardware Event Categories, HPM for whole program, and Derived Hardware Metrics).

d) Remarks, page 8, third paragraph, lines 1-6:

The examiner respectfully disagrees with Applicants' assertions. IBM-HPM explicitly teaches:

modifying performance profile data accumulated during a trace of a computer program execution to form annotated performance profile data (e.g., page 27, taking as input said performance files, modifying/annotating said performance profile data, and displaying said annotated performance profile data in HPMVIZ windows as in page 28),

wherein the annotated performance profile data includes annotations based on the occurrence of one or more events during execution of the computer program (e.g., pp. 27-28, annotating performance profile data by colors red/green, annotated performance profile data as annotated possible optimizations in corresponding source code which can be edited/selected by a programmer as in HPMVIZ windows in page 28).

e) Remarks, page 8, third paragraph, lines 6-10:

The examiner respectfully disagrees with Applicants' assertions. IBM-HPM explicitly teaches:

obtaining code for the computer program (e.g., computer program in HPMVIZ windows in page 28);

determining a manner for compiling the code to provide one or more optimizations to the runtime execution of the computer program based on the performance profile data and the annotations of the annotated performance profile data (e.g., page 28, from HPMVIZ windows, determining a manner for compiling

(optimizing code or not from said annotated possible optimization), and recompiling said code in pages 27 and 29).

f) Remarks, pp. 8-9, last paragraph (regarding Kosche and Sato):

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Furthermore, the examiner notes that the claimed language merely calls for "wherein the one or more optimizations include at least one of an optimization to instruction paths ..., and an optimization to storage ..." (claim 1, lines 11-15), which only requires either Kosche or Sato teaches the claimed limitations.

As previously set forth, IBM-HPM discloses profiling and optimizing branch/branch misses (p.6), branch prediction (p.10), and branch misprediction rate (p.12) but does not explicitly discloses *one or more optimizations include at least one of an optimization to instruction paths of the computer program at branch points such that a contiguous execution of instructions within the computer program is achieved.*

However, in an analogous art, <u>Kosche</u> further discloses *one or more optimizations include at least one of an optimization to instruction paths of the computer program at branch points such that a more contiguous execution of instructions within the computer program is achieved* (e.g., [0029]; [0034-0036]; FIG. 4-6 and related text).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Kosche's teaching into IBM-HPM's teaching. One would have been motivated to do so to make operations faster, executing more operations in parallel, increase performance, and avoid pipeline stalls as suggested by Kosche (e.g., [0007-0008] and [0011-0020]).

IBM-HPM discloses profiling and optimizing cache misses and cache hit rate (pages 3, 6, 10, and 12) but neither IBM-HPM nor Kosche explicitly discloses *one or more optimization to storage of instructions or data in a cache so that portions of a cache line that is falsely shared are stored in the cache on different cache lines.*

However, in an analogous art, <u>Sato</u> further discloses *one or more optimization to storage of instructions or data in a cache so that portions of a cache line that is falsely shared are stored in the cache on different cache lines* (e.g., col.29: 1-29; col.1: 29-46; FIG. 27-29 and related text).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Sato's teaching into IBM-HPM and Kosche's teaching. One would have been motivated to do so to reduce inter-cache conflict and shorten the execution time of the program as suggested by Sato (e.g., col.2: 18-22).

Accordingly, Applicants' arguments are not persuasive and the examiner respectfully maintains the 35 USC §103(a) rejection over claims 1, 11, and 20.

Claim Rejections – 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 11, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over IBM-HPM (art of record, "IBM Hardware Performance Monitor (hpm)", August 2002) in view of Kosche (art of record, US Patent Publication No. 2003/0005422 A1) and further in view of Sato (art of record, US Patent No. 6,681,388).

Claim 1:

IBM-HPM discloses a computer program product, a system, and *a method, in a data processing system, for optimizing runtime execution of a computer program* (e.g., pages 3, 8), *comprising:*

obtaining performance profile data accumulated during a trace of a computer program execution (e.g., pages 3, 6; and page 27, obtaining and saving performance profile data accumulated in performance files),

modifying performance profile data accumulated during a trace of a computer program execution to form annotated performance profile data (e.g., page 27, taking as input said performance files, modifying/annotating said performance profile data, and displaying said annotated performance profile data in HPMVIZ windows as in page 28),

wherein the annotated performance profile data includes annotations based on the occurrence of one or more events during execution of the computer program (e.g., pp. 27-28, using colors, annotating corresponding source code which can be edited/optimized, displaying performance profile data and derived hardware metrics)

wherein the one or more events occur based on hardware counter values and performance indicators associated with one or more portions of the computer program (e.g., pages 4-5);

obtaining code for the computer program (e.g., pages 27-28);

determining a manner for compiling the code to provide one or more optimizations to the runtime execution of the computer program based on the performance profile data and the annotations of the annotated performance profile data (e.g., pages 27-29),

wherein the one or more optimizations include at least one of an optimization to branch prediction (e.g., pages 10, 12), *and*

an optimization to cache misses and cache hit rate (e.g., pages 6, 10, 12);

presenting the one or more optimizations to a programmer for selection using one or more graphical user interfaces (e.g., pp. 27-28: using color red to recommend optimization as current metrics are below recommended values, using color green to indicate above threshold values, showing corresponding source code which can be edited/optimized);

receiving one or more selected optimizations of the one or more optimizations selected by the programmer (e.g., pages 27-28: adjusting/optimizing based on the red values, editing the corresponding source code which can be edited/optimized); *and*

compiling the code using the one or more selected optimizations to generate an optimized computer program (e.g., page 19, recollect performance profile data after optimizing computer program/code; pp. 21-22 and 26, recompile program/code after using one or more selected optimizations; page 27, regenerate annotated performance data based on selected optimizations; and page 32, recompile/rerun the program/code with the one or more selected optimizations).

IBM-HPM discloses profiling and optimizing branch/branch misses (p.6), branch prediction (p.10), and branch misprediction rate (p.12) but does not explicitly discloses *one or more optimizations include at least one of an optimization to instruction paths of the computer program at branch points such that a contiguous execution of instructions within the computer program is achieved.*

However, in an analogous art, Kosche further discloses *one or more optimizations include at least one of an optimization to instruction paths of the computer program at branch points such that a more contiguous execution of instructions within the computer program is achieved* (e.g., [0029]; [0034-0036]; FIG. 4-6 and related text).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Kosche's teaching into IBM-HPM's teaching. One would have been motivated to do so to make operations faster, executing more

operations in parallel, increase performance, and avoid pipeline stalls as suggested by Kosche (e.g., [0007-0008] and [0011-0020]).

IBM-HPM discloses profiling and optimizing cache misses and cache hit rate (pages 3, 6, 10, and 12) but neither IBM-HPM nor Kosche explicitly discloses *one or more optimization to storage of instructions or data in a cache so that portions of a cache line that is falsely shared are stored in the cache on different cache lines.*

However, in an analogous art, Sato further discloses *one or more optimization to storage of instructions or data in a cache so that portions of a cache line that is falsely shared are stored in the cache on different cache lines* (e.g., col.29: 1-29; col.1: 29-46; FIG. 27-29 and related text).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine Sato's teaching into IBM-HPM and Kosche's teaching. One would have been motivated to do so to reduce inter-cache conflict and shorten the execution time of the program as suggested by Sato (e.g., col.2: 18-22).

Claim 11:

Claim 11 is a computer program product version, which recites the same limitations as those of claim 1, wherein all claimed limitations have been addressed and/or set forth above. Therefore, as the references teach all of the limitations of the above claim, they also teach all of the limitations of claim 11.

Claim 20:

Claim 20 is a system version, which recites the same limitations as those of claims 1 and 11, wherein all claimed limitations have been addressed and/or set forth above. Therefore, as the references teach all of the limitations of the above claims, they also teach all of the limitations of claim 20.

Conclusion

7. Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication should be directed to examiner Thuy Dao (Twee), whose telephone/fax numbers are (571) 272 8570 and (571) 273 8570, respectively. The examiner can normally be reached on every Tuesday, Thursday, and Friday from 6:00AM to 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam, can be reached at (571) 272 3695.

The fax phone number for the organization where this application or proceeding is assigned is (571) 273 8300.

Any inquiry of a general nature of relating to the status of this application or proceeding should be directed to the TC 2100 Group receptionist whose telephone number is (571) 272 2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov.

Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

T. Dao
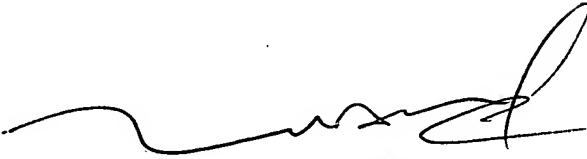
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